Madam Felix-Hodson District Gold Mines and Mills
Southern edge of Salt Spring Valley
Copperopolis Vicinity
Calaveras County
California

HAER No. CA-76

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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Historic American Engineering Record
Western Regional Office
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San Francisco, California 94102

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HISTORIC AMERICAN ENGINEERING RECORD

Madam Felix-Hudson District Gold Mines and Mills

HAER No. CA-76

Location:	Beginning at the intersection of Old Hodson Road and Highway 4, 1 miles west of Copperopolis; north on Old Hodson Road, the district begins after 1 mile and extends about 1/2 mile on either side until reaching Rock Creek Road, 3 miles to the north Copperopolis vicinity,Calaveras County, California UTM: NW point - 10.700980.4210250 SW point - 10.701820.4208000 SE point - 10.704700.4206000 NE point - 10.702620.4210025 Quad: Copperopolis and Salt Spring Valley, California
Dates of Construction:	Seven mills, with subsequent alterations made to most of the individual mills to serve their respective mines: Pine Log Mill [HAER No. CA-76-A] - 1870 Empire Mill [HAER No. CA-76-B] - 1896 Wilbur-Womble Mill [HAER No. CA-76-C] - 1901 Royal Mill [HAER No. CA-81] - 1902-03 Mountain King Mill [HAER No. CA-77] - 1904-05 Defiance (Brown) Mill [HAER No. CA-76-D] - 1910 Gold Knoll Mill [HAER No. 76-E] - 1928-29
Engineers:	Only two are known: J. H. Finley for the Mountain King and A. E. Roberts for the Royal Mill
Builders:	Various - discussed under individual mill histories
Present Operator:	Meridian Gold Company P.O. Box 190 Copperopolis, CA 95228
Present Use:	Only sites and foundations of the mills remain. Most of these will eventually be obliterated or removed by current open-pit mining activities.
Significance:	The Madam Felix-Hudson Mining District is significant in that it contains remains representing the entire span of mining activities in this area, from the middle 1850s

through to the present day. Evidence for the earliest small stamp mills constructed between 1858 and 1865 could not be located, although sites and foundations were found for the seven stamp mills constructed in the period 1870-1930. These mills are characteristic of the type used throughout the gold-mining districts of California, especially the Mother Lode. They became obsolete during the first two or three decades of this century and only a very few, mostly incomplete examples, have been preserved in California.

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MADAM FELIX-HODSON DISTRICT GOLD MINES AND MILLS

Summary of District History

The Madam Felix-Hodson mining district constitutes one of the smaller of the California Mother Lode districts, and is located on the West Belt, some seven or eight miles west of the main lode. With a gold production of about 180,000 ounces (prior to 1989), it would be classified as a third-rate district. The current mining operation will certainly raise it to second-class rating, but is doubtful that it will reach first class (over 1,000,000 ounces). It is because of the present open-pit mining operation,which will obliterate most traces of historic mining activities, that the present HAER recordation was conducted. Also produced as part of the mitigation program is a popular book on the history of the district, Madam Felix's Gold (Fuller, et al. 1991).

The first actual mining in this district occurred in the late 1850s, some eight or nine years after the California gold rush began. These "new diggings" consisted of small-scale surface placer mining in the various draws draining off the low hills. Water was required to wash the gold from the "paydirt," so several small reservoirs were constructed to catch the winter rainfall with ditches to convey the water to the various placer diggings. This activity soon expanded into prospecting the vein outcrops that appeared to be the source of the gold in the placer deposits. By 1859, there were three small stamp mills operating in or near the district, crushing gold-quartz ores from the different prospecting ventures nearby. The Morgan-Shephard 8-stamp mill, water-powered, was at Rock Creek, just below the Salt Spring Valley Reservoir, and about three or four miles from the mining district. The steam-powered Forsman-Collier 12-stamps operated in the eastern part of the district, on Littlejohn's Creek. The "new" Morgan Mill, apparently a little 2-stamp prospector's mill, was located nearby, also run on steam power.

During the copper-mining boom of Civil War days, gold prospecting and mining in Calaveras County was abandoned in favor of the red metal. In 1865, however, another gold stamp mill was built in the district as apparently the earlier mills had all been deactivated or destroyed: Forsman-Collier's had burned down and the mill on Rock Creek may or may not have been in operable condition. The new mill, of 10 stamps and steam-powered, was built by Joseph C. Duncan of the Alban Ranch Mining Company. It was located in the heart of the district, in the lower end of the little valley of Pine Log Creek, to process ores from the predecessors of the later Royal and Mountain King mines. A small

reservoir, extant until 1988, was apparently its water supply (the site of this mill is shown on the 1871 GLO plat of Township 2 North, Range 12 East). The mill was destroyed by fire prior to 1869. In 1887, a small Huntington mill was installed on the site by John F. Carter, but was shortly thereafter removed.

Another small mill, of five stamps, was erected in 1869-70 by James Tulloch (HAER CA-76-A). Located on Littlejohn's Creek near the former site of the Forsman-Collier mill, it processed ore from nearby prospecting operations. Tulloch probably operated this mill for only a year or so and then it apparently was idle until taken over by Henry Botcher of the Pine Log Mining Company about 1876-7.

With the start-up of active operations of the Pine Log company, serious and successful mining began in the district, albeit of small scale. The Tulloch mill was reactivated to process ore from the Pine Log mine, about 1 1/2 miles to the northwest, which was operated by Henry Botcher to 1881, then by Christopher Castle and associates. When mining was discontinued at the Pine Log mine in 1884, the mill processed ore from the nearby Royal Mine, hauled down by a horse-tram.

In 1885, the Pine Log company took over the Royal mine, creating a new operating company, the Royal Consolidated Mining Company (Figure 1). William Hendricks was first superintendent of operations, and was followed by superintendents Vietong and Jutton. Principal owners of the Royal Consolidated were Isaac R. Wilbur, Christopher Castle and James Castle, and J.D. Peters. In 1897, the Royal was bought out by an English Company, under the management of J.C. Kemp van Ee, and became the principal gold-producing operation of the district with the Pine Log mill enlarged to accommodate 40 stamps (Figure 2). The little town of Hodson was built near the mill by Kemp van Ee in 1898-9 and named after his English backer, John T. Hodson. The Pine Log mill was replaced by the Royal mill in 1903 and destroyed by fire in 1915 after some of the equipment had been salvaged (Photo HAER CA-76-A-1). (Additional details of the history of the Pine Log and Royal mills are included in HAER CA-81, the Royal Consolidated Gold Mine and Mills.)

The general gold mining boom throughout the Mother Lode commencing in the 1890s was fueled by the steadily expanding improvements in mining and milling technology. This resulted in greatly increased mining activity in the Madam Felix-Hodson district as well as elsewhere in the county. The Gwin mine at Paloma, the Utica at Angels Camp, and the Melones mine at Carson Hill were all in full production. The next mill to be built in the district, the Empire, was the little 5-stamp mill constructed by Hunt and Livingston in 1896 (Figure 3). This operation was apparently very short-lived because of legal and ownership problems.

The Empire claim was the site of the critical Castle vs Womble mining contest case before the Government Land Office that established the "prudent man's rule" for mining rights. A landmark decision, handed down in December, 1894, it declares that requirements of the statutes regarding mining claims have been met if it can be shown that a miner of ordinary prudence would be justified in the further expenditure of his labor and means in developing the mine in question. In 1892, before the Castle versus Womble contest had been settled, August Trenschel and associates took over the Empire claim and set up the Empire Gold Mining and Milling Company to develop this mine. In 1895, under the supervision of F. B. Livingston, the company began underground development and built a small five-stamp mill. Hardly had operations begun, however, when internal squabbles over ownership coupled with financial difficulties created litigation that closed down the operation. A few years later the mill was dismantled and moved to the Benson mine near Angels Camp. Today, only the mine portal, mill terraces, rock foundations, and some minor machinery and boiler placements remain to indicate the site of this historic but unfortunate mine (HAER CA-76-B-1).

In 1901, Isaac R. Wilbur, one of the former owners of the Royal, and E.I. Braddock opened up the Wilbur-Womble mine on the southern extension of the Royal vein, on land belonging to the Womble ranching family. The mill they built was unusual for being equipped with two 3-stamp, "triple-discharge" batteries. Like all earlier stamp mills of the region, these were mounted on massive wooden underpinnings. In 1903, Braddock, who had bought out Wilbur's interest in the operation, expanded the mill by adding three more Merrill 3-stamp batteries, bringing the total number of stamps to fifteen (Figure 4). These new batteries were mounted on innovative concrete bases (HAER CA-76-C-2), similar to those at the new Royal mill nearby, then under construction. The Wilbur-Womble operation, however, was a failure and was closed down the following year. The Womble brothers briefly reopened the Wilbur-Womble in the mid-teens, but were unsuccessful in their operation (Figure 5). Subsequently the mill was demolished and some equipment was moved to the Gold Knoll mill (HAER CA-76-C-1).

The largest mill ever built in the district was at the Royal mine, constructed in 1902-3 (recorded in separate documentation as HAER No. CA-81). This unique structure was designed by J.C. Kemp van Ee and A. E. Roberts, patterned after the giant Alaska Tredwell mill. It was situated on top of a hill rather than on the slope, however, with six 10-stamp batteries on one side and, back-to-back, another six batteries facing the opposite direction. The necessary vertical fall, or drop, was obtained partly by the topography and partly by the height of the mill

building. Like the Wilbur-Womble, this mill was one of the early Mother-Lode operations to mount stamp batteries on concrete foundations.

The Royal mill, one of the largest along the Mother Lode, was actually used at full capacity for only two years. A shortfall in cash flow resulting from poor ore grades and low mill recoveries, a serious strike, and legal and ownership problems, together contributed to a forced closure of the operation in November 1905 (Fuller 1978; Hiatt-Fuller 1968). Unsuccessful attempts to reactivate the mine and the mill were made a decade later. During the late 1920s and through to the early 1940s, the mill was operated at between 10 and 20 percent of its original capacity. The Royal mill was salvaged during the early 1950s and only the foundations and excavations remain.

Shortly after the Royal Mill was put into service, the Mountain King company completed a small 10-stamp mill at its property nearby (recorded in separate documentation as HAER No. CA-77). This mill, with extensive alterations in the late 1930s and early 1940s, was active until 1947. It was demolished in the 1960s and the equipment salvaged. Although most of the mills in the Madam Felix-Hodson Mining District processed only gold ore produced from the mines at which they were built, the Mountain King mill was converted to treat copper ore from the Copperopolis district during World War II. This was the only one of the district gold mills to operate after World War II, with the exception of some very limited work at the Royal mill.

Remains of a very small mill were recorded on the Defiance claim (HAER CA-76-D-1). The claim was located over earlier workings in 1898 by local rancher Jackson D. McCarty who constructed the mill in 1910. Ore was trammed from the adjacent surface workings to the mill site which consisted of a 2-stamp mill, amalgamating plates, concentrating table, and Frue vanner. Power was supplied by a converted tractor boiler, set up on blocks with its wheels pulled off. Jackson's son, Cyril McCarty, ran the mill in the 1930s and it was leased out as late as 1938.

When the 10-stamp Gold Knoll mill was built in the late 1920s under the direction of E.E. Schmitz, it was the last stamp mill to be put into operation in the district (Figure 6). The mill was actually used for only a few years, and a relatively small tonnage of ore was processed. A substantial part of this was apparently mined from a glory hole from which the ore was hoisted to the surface through the inclined shaft, and trammed to the mill bins (Figure 7). A small truck dump was also built for receiving ore from other mines for custom milling. After some small-scale leasing operations in the thirties and into the war years, activities at the Gold Knoll ceased. Subsequently the milling and other equipment were removed and the buildings demolished (HAER CA-76-E-1).

From 1947 until 1985, a number of mining companies did some explorations in the districts principally aimed at low-cost open-pit targets. Then an option on the entire district was obtained by the Meridian Minerals Company of Denver, who, after extensive investigations, opened up a large surface mine equipped with a modern processing mill, commencing production early in 1989.

The majority of the mining and milling operations in the Madam Felix-Hodson district were actually failures. Only one mine, the Royal, was a financial success, and that was only during the 1885-97 and the 1932-42 periods. The various operating periods between these, especially the spectacular Kemp van Ee attempt, failed. None of the other mines in the district, with the possible exception of the tiny Pine Log, ever showed a profit. The lack of understanding of the nature of the gold occurrence and inadequate technology, coupled with insufficient financial resources, explain these repeated failures. The gold was there, but was lower in grade, generally too fine-grained, and much of it too intimately associated with pyrite, to be successfully recovered by the stamp milling and amalgamation techniques. The modern low-cost open-pit mining method and the "state-of-the-art" processing plant of the current Meridian Gold Mining Company has overcome these difficulties and is expected to successfully recover more than half a million ounces of gold, three or four times as much as has previously been mined in the district.

Summary of District Gold Milling Techniques

The stamp mill was introduced to the California gold fields in the first years of the gold rush, imported from England or Spain (Young 1970:195). It became the standard gold ore milling method here until replaced by the ball mill in the first two or three decades of the present century. It was a simple, practical, and effective process. The stamps were commonly mounted in "batteries" of five, and generally in two five-stamp batteries together. Small mills, mostly for prospecting operations, were often designed with one, two, three, or four stamps as a battery. Large mills were composed of ten-stamp units (two fives mounted together) with as many units as required to obtain the desired capacity. The Royal mill had twelve such units, for a total of 120 stamps (Hammond 1888; Rickard 1897; Preston 1895).

The stamps were mounted in a heavy wooden framework consisting of both upright and horizontal members. The earlier stamp mills had massive wooden footings. Later installations used concrete foundations, although smaller mills often continued to use wooden footings which were considered by many operators to be beneficial in reducing wear to the equipment. The weight of

the individual stamps varied considerably and newer mills used larger, heavier stamps to obtain greater capacity.

Typically, a fully operable stamp mill consisted of a crusher at the head of the mill building, ore bins, and then the milling or stamp battery floor, with concentrators for the crushed ore on lower levels (Figure 8). Normally, the gold-quartz ore was delivered by a hoisting skip, or by a tram on a trestle, to an ore bin at the head of the mill structure. The latter was generally built on the side of a hill, with excavations into the hill to provide level space for each floor or deck. The hillside location allowed for gravity flow of the ore and pulp (ground ore mixed with water) through the various milling processes. The first stage was to run the ore through a "rock-breaker" or crusher, generally of the jaw type, reducing the size of the rock particles to less than about one inch. Power was supplied to the crusher from a belt off the main "line shaft" in the mill. The line shaft was run by either steam or water in the early mills, and by an electric motor after electricity was available. The crushed product was discharged into another bin, called the mill bin. Many gold mills mounted the crusher in the headframe at the shaft or hoisting works especially if it was necessary to tram the ore over a trestle to the mill. This was the method used at the Royal operation.

The crushed ore was then slowly "pulled out" of the mill bin and fed into the stamp mill battery by one of a variety of ingenious automated feeders staged to the stamping operation. Water was also introduced into the battery so that the stamps would pulverize the ore into a watery pulp. The motion of the stamps was controlled by a cam-shaft activated by a belt drive from the main line shaft. A separate "bull gear" and cam shaft was used for each 5-stamp battery. The setting of the individual cams determined the order in which each stamp would drop. Typically, the stamps dropped about six inches, smashing into the ore-water mixture in the mortar battery about 100 times a minute. A slight rotation was also imparted to the dropping stamp. The stamp was fitted with a "shoe" that pounded the ore on a "die" mounted in the mortar. These units were all replaceable so that new ones could be installed when the old ones wore out. Either iron or steel was used for the shoes and dies depending upon the era of the mill, or the preference of the operator. A stamp mill of this type usually could pulverize from two to five tons of ore per stamp per day, depending upon the size and rate of drop of the stamps.

Quicksilver (mercury) was introduced into the mortar to form an amalgam with any "free" gold liberated from the ore during the stamping. For the Sierran region, this free gold was actually a natural amalgam consisting of about 85% gold and 15% silver, although in the Madam Felix district, the gold content was as low

as 70%. The natural gold-silver amalgam readily combined with the quicksilver present to form an artificial amalgam high in mercury content.

The mortar was designed with a screen on the lower or discharge side and the splashing action of the stamps in the mortar washed the finer ore particles in the pulp through the screen and down onto the amalgamating plates below. These plates were mounted at the discharge of the mortars and on an apron just below the discharge. Additional plates were installed on platforms or tables just downflow from the mortar. The plates were made of copper, and were silver-plated on top, which attracted the amalgam as well as any surplus quicksilver. They were periodically scraped to collect any amalgam adhering to them. The remaining pulp was washed on down to the next stage of the processing.

The gold values remaining in the pulp were associated with sulfide minerals (such as pyrite, arsenopyrite, and rarely other sulfides) and therefore could not be recovered by simple amalgamation. The use of shaking tables and vanners was made to recover these sulfides (or sulphurets, as they were then often called) as the sulfide mineral particles were at least twice as heavy as the barren mineral fragments. The combination of additional wash water added on the tables to the pulp, plus shaking action on a table with riffles or other irregularities, was very effective in separating the gold-bearing material from the gangue (non-metalliferous mineral matter). In addition, free gold, amalgam and quicksilver that had escaped capture on the amalgamation plates, could be recovered here. Additional recovery of the sulfides was obtained by running the pulp next over vanners. Many gold mills ran the pulp directly to vanners from the amalgamating plates, without using concentrating tables.

A vanner consisted of an endless rubber belt moving in a slightly upward direction. The pulp was introduced near the upper end of the moving belt. The sulfide particles tended to stick to the belt as it went over the upper pulley, and were caught underneath. The gangue materials were merely washed down the moving belt against its direction of movement and were discharged at the lower end as tailings. A slight sidewise vibration of the equipment was employed to accentuate its concentrating action. The concentrates were then stored for shipment to the Selby smelter near San Francisco. Eventually the vanners were replaced by the Wilfley and other similar concentrating tables and by flotation -- a method using small metal tanks with frothy chemicals to make a separation by depressing some minerals and floating others).

Good California gold mill operation would recover between 85 and 95 percent of the gold values present in quartz-vein ore. Some milling operations reground the concentrates with

quicksilver, in order to recover more gold as well as salvage escaping amalgam and "quick." The amalgam (recovered by scraping the amalgamation plates just below the stamping operation described earlier) would be squeezed in chamois or similar material to salvage excess or uncombined quicksilver. The remaining amalgam was placed into a cast-iron vessel, which was clamped and sealed, heated, and the vaporized mercury cooled and liquified in a condenser and collected under water, thus salvaged for further use. This process was called "retorting." The resulting "sponge" of gold, containing about 15-30 percent silver and minor impurities of base metal, could then be sold as sponge, or melted down and poured into "dore" bars, and then sold.

Figure 1 Looking northwest at The Pine Log 10-stamp mill about 1892, Littlejohn's Creek in foreground. Part of the company buildings and the boardinghouse can be seen on the extreme right. Calaveras County Historical Society (CCHS) Photo No. 819.

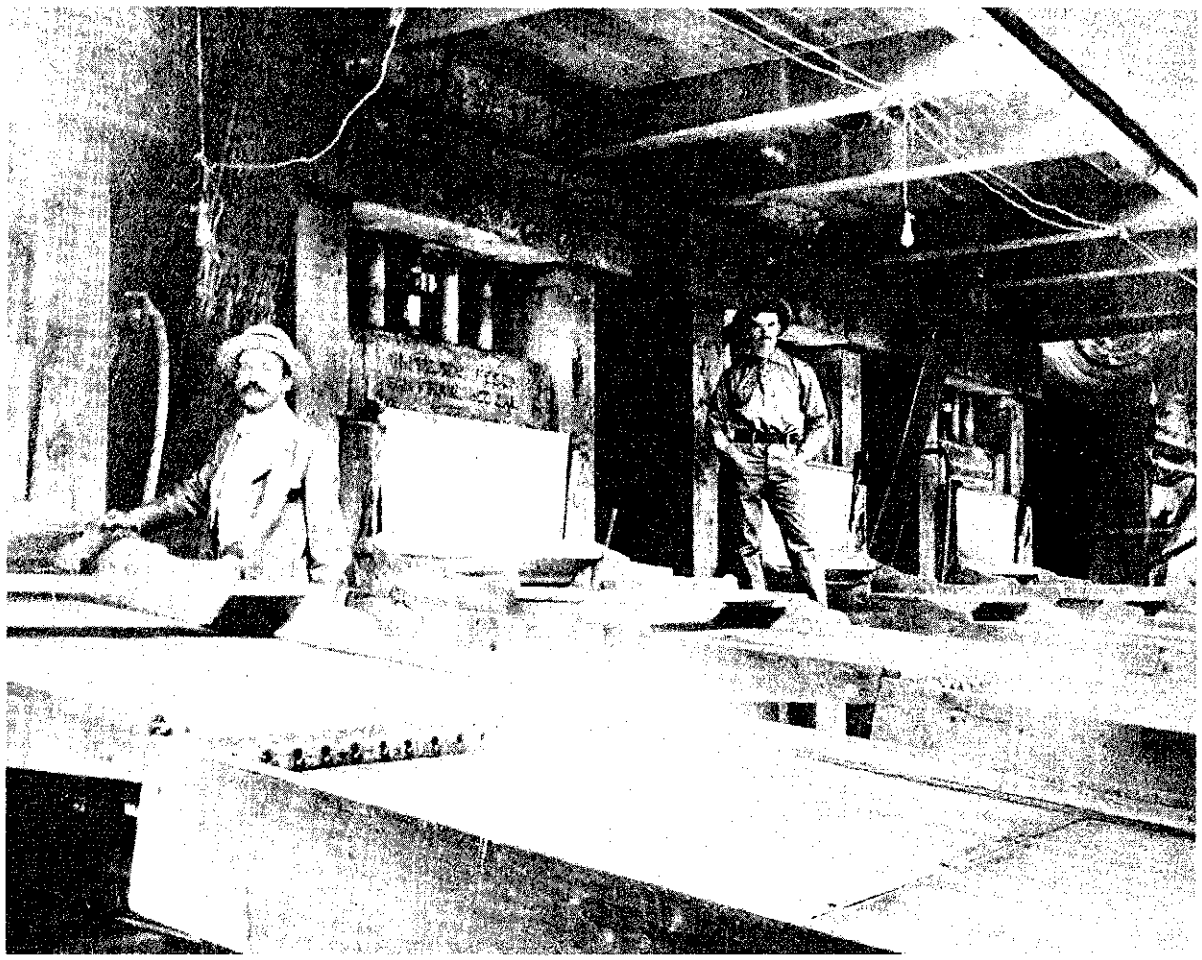

Figure 2 Interior view of the Pine Log mill after it was expanded to forty stamps in 1898. William Dennis, photographer, at left. CCHS Photo No. 1069.

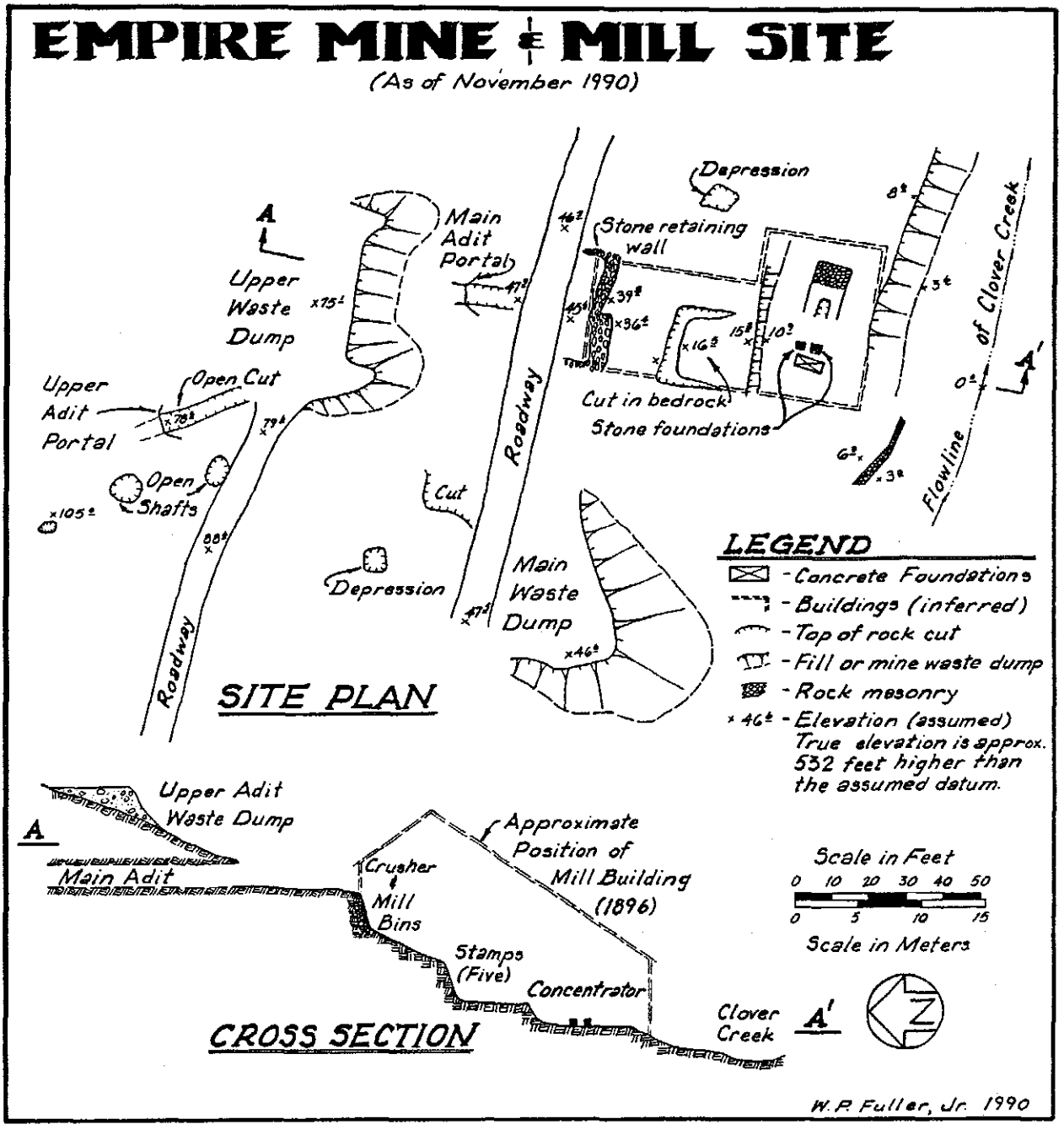

Figure 3 Site plan and cross section of the Empire mine and mill site.

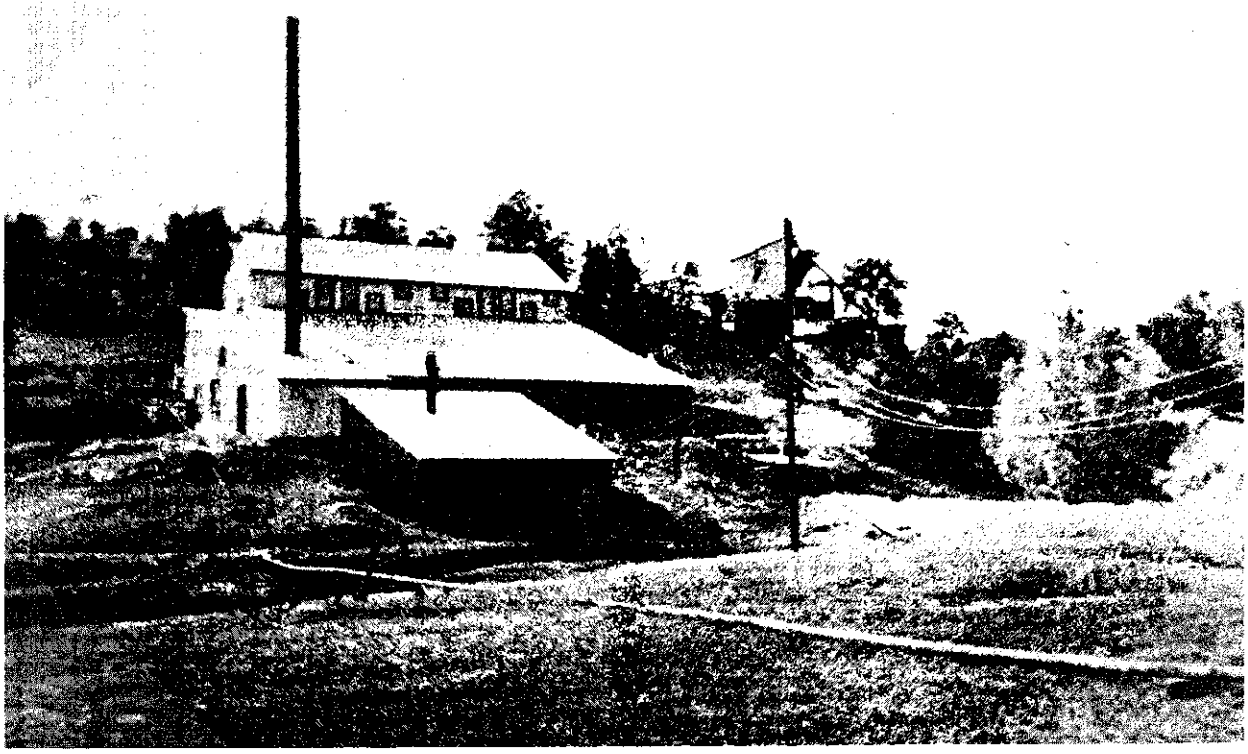

Figure 4 View of the Wilbur-Womble mill from the southeast about 1915. The headframe and crusher building are seen on the skyline at right. CCHS Photo No. N816A.

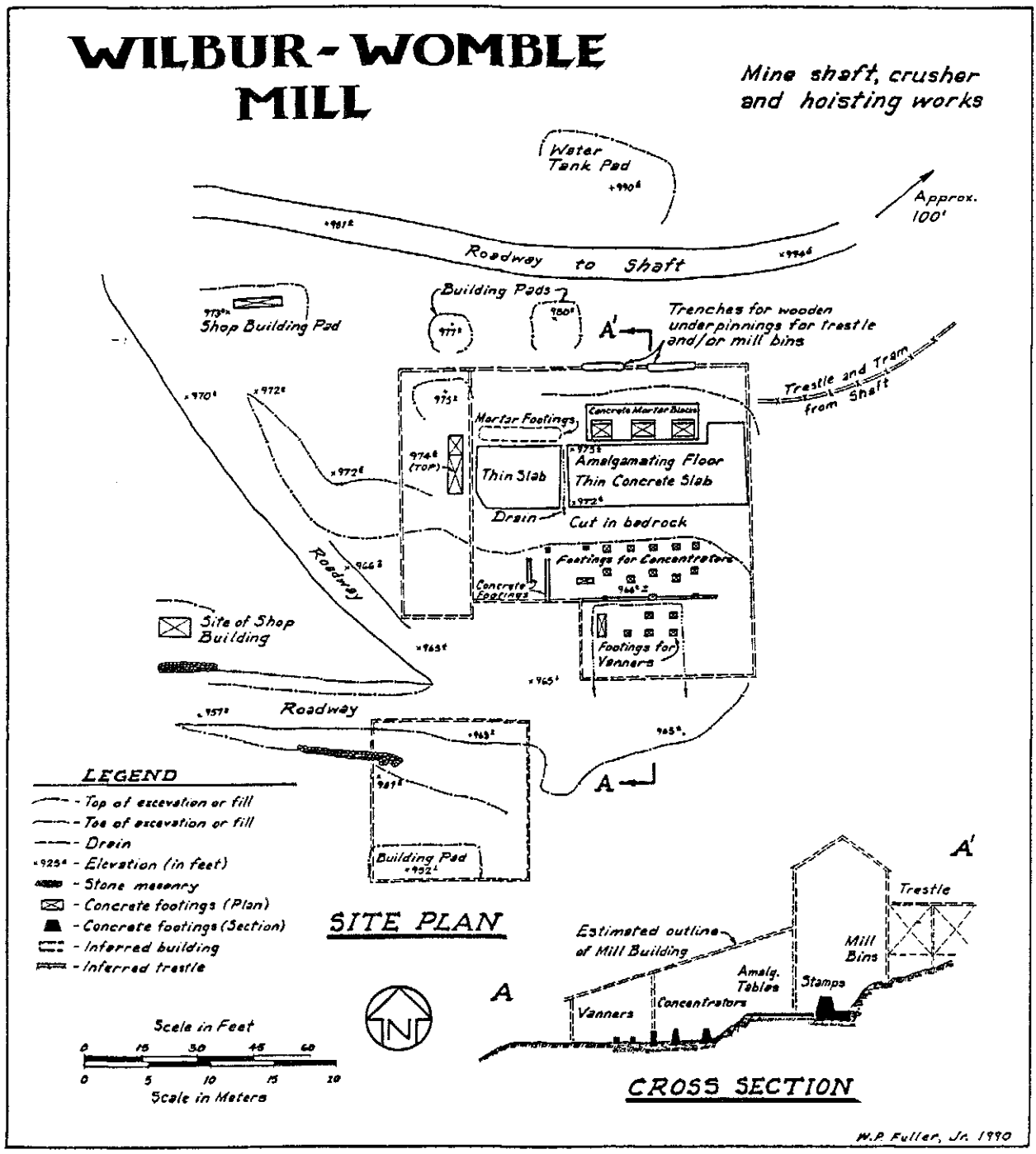

Figure 5 Site plan and cross section of the Wilbur-Womble mill.

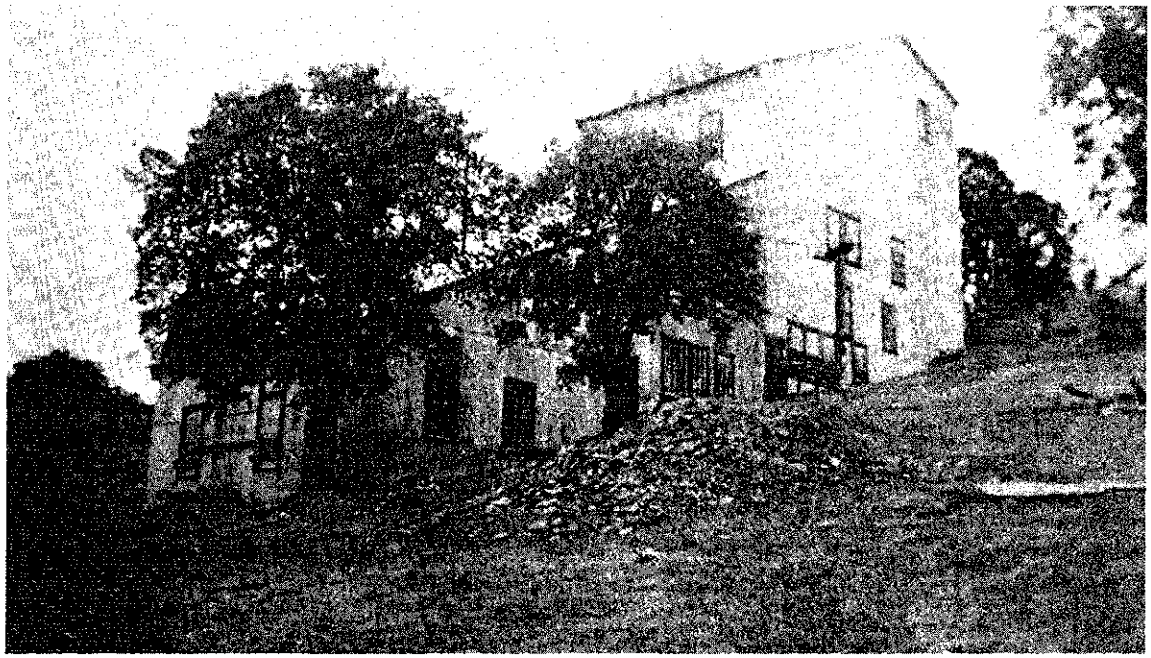

Figure 6 The Gold Knoll mill from the northeast in the mid 1930s. CCHS Photo No. 2141.

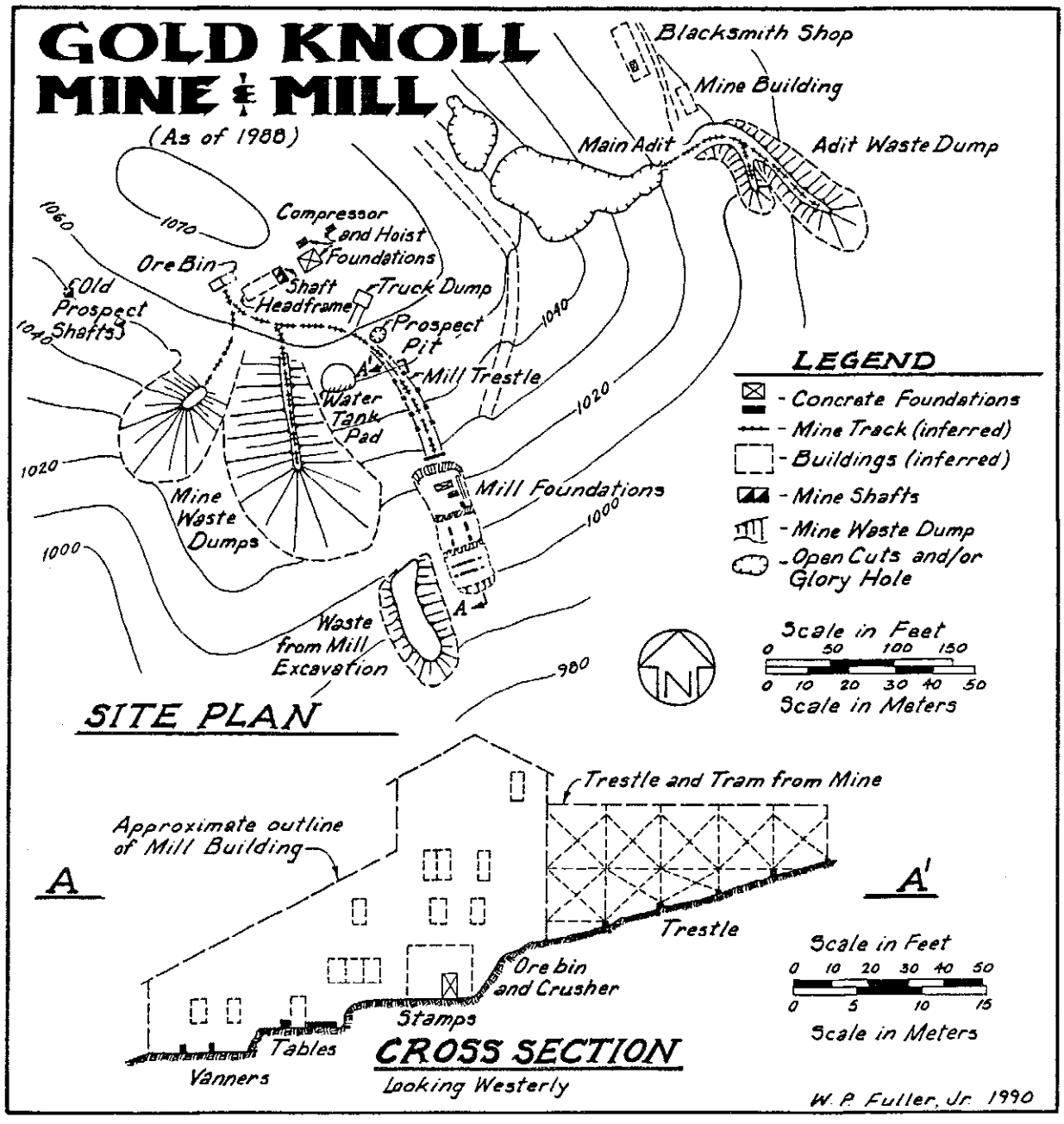

Figure 7 Site plan of the Gold Knoll mine and cross section of the mill building.

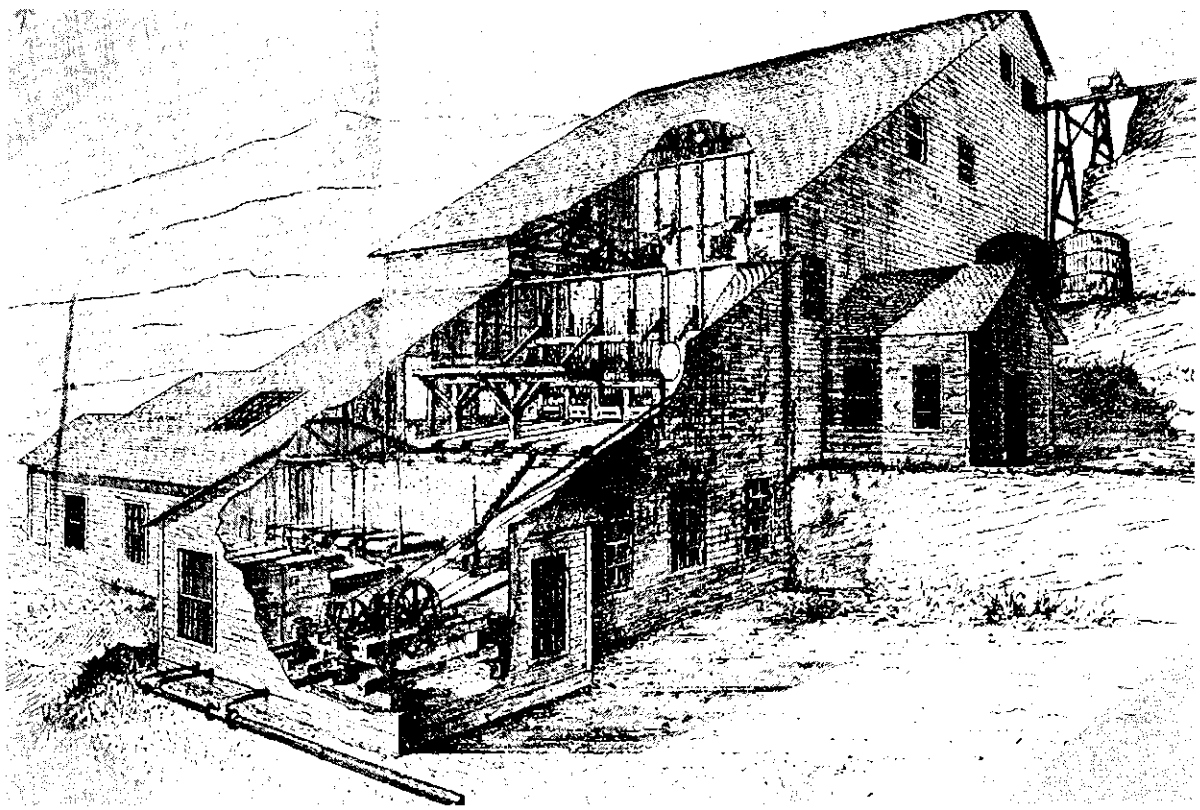

Figure 8 A typical 40-stamp mill. Ore was trammed to primary crushers on the upper floor, gravity-fed to the stamp mortars below, and then to the concentrating tables on the lower deck. (Hammond 1888)

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